CLAIMS

1. A method for forming a planarizing medium for planarizing a microelectronic substrate, comprising:

separating a planarizing medium material into discrete elements;

disposing the discrete elements and a film support material on a support liquid with portions of the discrete elements spaced apart from each other and projecting from the support material and with the discrete elements configured to engage the microelectronic substrate and remove material from the microelectronic substrate; and

drawing the support material and the discrete elements from the support liquid by engaging the support material with a backing material and moving the backing material away from the support liquid.

2. The method of claim 1 wherein the planarizing medium material includes a planarizing pad material, and wherein the method further comprises distributing a plurality of abrasive particles in the planarizing pad material before separating the planarizing pad material into discrete elements, and wherein the discrete elements include at least some of the abrasive particles in the discrete elements.

3. The method of claim 2 wherein the support material has a first surface and a second surface opposite the first surface, further comprising distributing the abrasive particles to occupy from about 1% to about 50% of a surface area of the first surface of the support material.

4. The method of claim 1, further comprising selecting the planarizing medium material to consist of abrasive elements.

5. The method of claim 1 wherein at least a portion of the planarizing medium material is in a liquid phase and separating the planarizing medium material includes mixing the planarizing medium material with a stream of gas and forming discrete droplets of the planarizing medium material.

6. The method of claim 1 wherein separating the planarizing medium material includes separating the planarizing medium material into droplets when the planarizing medium material is in a liquid state, and further comprising at least partially solidifying the droplets before disposing the droplets on the support material.

7. The method of claim 1, further comprising forming the discrete elements to have a maximum cross-sectional dimension of from approximately 5 microns to approximately 200 microns when the discrete elements are on the support material.

8. The method of claim 1, further comprising disposing the discrete elements on the surface of the support material to project from the surface of the support material by a distance of from about 2 microns to about 200 microns.

9. The method of claim 1, further comprising attaching the discrete elements and the support material after the discrete elements are disposed on the support material.

10. The method of claim 9 wherein attaching the discrete elements includes curing the discrete elements and changing a shape of the discrete elements to taper the discrete elements, with the discrete elements being wider at a point adjacent to the support material that at a point spaced apart from the support material.

11. The method of claim 1, further comprising selecting the planarizing medium material to include a thermoset or a thermoplastic material.

12. The method of claim 1, further comprising forming the discrete elements to have an upper surface spaced apart from the surface of the support material with the upper surface having blunt or rounded edges.

13. The method of claim 1, further comprising passing the discrete elements through an orifice toward the support material and moving at least one of the orifice and the

support material relative to the other to distribute the discrete elements over the support material.

14. The method of claim 1, further comprising passing the discrete elements through apertures to control the distribution of the discrete elements on the support material.

15. The method of claim 1 wherein disposing the discrete elements on the support material includes dropping the discrete elements onto the support material from above.

16. The method of claim 1, further comprising at least partially curing the discrete elements before disposing the discrete elements on the support material.

17. The method of claim 1, further comprising distributing the discrete elements to have a first spacing in a first portion of the support material and a second spacing in a second portion of the support material with the first spacing different than the second spacing.

18. The method of claim 1 wherein disposing the discrete elements includes forming a jet comprising discrete elements and directing the jet toward the surface of the support material.

19. The method of claim 1, further comprising selecting the support material and the planarizing medium material to have the same chemical composition.

20. The method of claim 1, further comprising mixing the discrete elements with the film support material and disposing the discrete elements and the film support material on the support liquid together.

21. The method of claim 1, further comprising disposing the film support material on the support liquid, then disposing the discrete elements on the film support material.

22. The method of claim 1, further comprising buffing the discrete elements after attaching the discrete elements to the backing material.

23. The method of claim 1 wherein the film support material is sacrificial and wherein the method further comprises:

engaging the film support material with the backing layer;

attaching the discrete elements to the backing layer; and

removing the film support material after attaching the discrete elements to the backing layer.

24. A method for forming a textured planarizing pad, comprising:

floating a film of a support material on a supporting liquid;

separating a planarizing pad material into discrete elements;

distributing the discrete elements in and/or on the support material; and

drawing the support material and the discrete elements from the supporting liquid by engaging the support material with a backing material and moving the backing material away from the liquid.

25. The method of claim 24, further comprising separating the planarizing pad material into discrete elements and mixing the discrete elements with the support material before disposing the support material on the surface of the liquid.

26. The method of claim 24, further comprising selecting the support material to include an organic Langmuir-Blodgett film material.

27. The method of claim 24, further comprising selecting the supporting liquid to include water.

28. The method of claim 24, further comprising disposing the discrete elements onto the support material after disposing the support material on the liquid.

29. The method of claim 24, further comprising disposing the support material on the surface of the liquid to a thickness of one molecule.

30. A method for removing material from a microelectronic substrate, comprising:

forming a planarizing pad by floating a film of a first support material on a supporting liquid, separating a planarizing pad material into discrete elements, distributing the discrete elements in and/or on the support material, and drawing the support material and the discrete elements from the supporting liquid by engaging the support material with a backing material and moving the backing material away from the liquid;

engaging the planarizing pad with the microelectronic substrate; and

moving at least one of the planarizing pad and the microelectronic substrate relative to the other to remove material from the microelectronic substrate.

31. The method of claim 30, further comprising separating the planarizing pad material into discrete elements and mixing the discrete elements with the support material before disposing the support material on the surface of the liquid.

32. The method of claim 30, further comprising selecting the support material to include an organic Langmuir-Blodgett film material.

33. The method of claim 30, further comprising disposing the discrete elements onto the support material after disposing the support material on the liquid.

34. The method of claim 30, further comprising disposing a planarizing liquid between a planarizing surface of the planarizing pad and a surface of the microelectronic substrate.

35. A planarizing pad for planarizing a microelectronic substrate, comprising:

a generally planar backing layer;

a one-molecule thick film support layer on the backing layer; and

a plurality of texture elements disposed on the film support layer, portions of the texture elements being spaced apart from each other and projecting from the film support layer, each texture element having a generally smooth upper surface, smoothly transitioning to a generally smooth side surface without asperities.

36. The planarizing pad of claim 35 wherein the texture elements have a plurality of abrasive particles embedded therein.

37. The planarizing pad of claim 35 wherein the texture elements include partially spherical droplets.

38. The planarizing pad of claim 35 wherein the texture elements have a cross-sectional dimension of from approximately 5 microns to approximately 200 microns.

39. The planarizing pad of claim 35 wherein the film support layer includes a removable sacrificial material.

40. The planarizing pad claim 35 wherein the texture elements have a first spacing in a first region of the film support layer and a second spacing in a second region of the film support layer with the first spacing different than the second spacing.

41. The planarizing pad of claim 35 wherein the texture elements and the film support layer have the same chemical composition.

42. The planarizing pad of claim 35 wherein the backing layer includes a plurality of raised features separated by recessed channels, and the film support layer conforms to the raised features.

43. An apparatus for forming a planarizing pad for mechanically and/or chemically-mechanically planarizing a microelectronic substrate, comprising:

a support device configured to support a backing material in a selected position;

a first vessel configured to contain a non-solid planarizing pad material; and

at least one nozzle operatively coupled to the first vessel and coupled to a source of compressed gas, the nozzle configured to mix the planarizing pad material with the compressed gas to form discrete texture elements; and

a second vessel configured to contain a support liquid that supports the discrete texture elements and a film, wherein the support device is positioned proximate to the second liquid vessel to move the backing material relative to the second liquid vessel and draw the film from the second vessel.

44. The apparatus of claim 43 wherein the support device includes first and second rollers coupled to the backing material and rotatable relative to each other to advance the support backing material from the first roller to the second roller.

45. The apparatus of claim 43, further comprising a hopper positioned between the nozzle and the second vessel, the hopper having a first opening positioned proximate to the at least one nozzle and a second opening proximate to the second vessel when the film is supported by the support liquid.

46. The apparatus of claim 43 wherein the film is elongated in a longitudinal direction and the at least one nozzle is the first of two nozzles coupled to the first vessel, the second nozzle being offset in the longitudinal direction and in a lateral direction transverse to the longitudinal direction relative to the first nozzle.

47. The apparatus of claim 43, further comprising:

a manifold coupled to the first vessel;

a first spraybar coupled to the manifold and extending over the second vessel in transverse direction when the film is supported by the support liquid, the first nozzle being connected to the first spraybar; and

a second spraybar coupled to the manifold and spaced apart from the first spraybar in the longitudinal direction, the second spraybar extending transversely over the second vessel when the film is supported by the support liquid, the second nozzle being connected to the second spraybar.

48. The apparatus of claim 43, further comprising a heating element positioned proximate to the support device and proximate to the backing material when the backing material is supported by the support device.

49. The apparatus of claim 43, further comprising a grate between the nozzle and the second vessel, the grate having a plurality of apertures sized to pass the discrete texture elements therethrough.

50. An apparatus for planarizing a microelectronic substrate, comprising:

a platen having a generally flat support surface;

a planarizing pad disposed on the support surface of the platen, the planarizing pad including a generally planar backing layer, a one-molecule thick film support layer on the backing layer, and a plurality of texture elements disposed on the film support layer, portions of the texture elements being spaced apart from each other and projecting from the film support layer, each texture element having a generally smooth upper surface, smoothly transitioning to a generally smooth side surface without asperities; and

a carrier proximate to the platen and configured to support a microelectronic substrate against the planarizing pad, at least one of the carrier and the platen being movable relative to the other.

51. The apparatus of claim 50 wherein the texture elements have a plurality of abrasive particles embedded therein.

52. The apparatus of claim 50 wherein the texture elements include partially spherical droplets.

53. The apparatus of claim 50 wherein the texture elements have a maximum cross-sectional dimension of from approximately 5 microns to approximately 200 microns.

54. The apparatus of claim 50 wherein the film support layer is elongated in a longitudinal direction and extends from a supply roller to a take-up roller.